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THE SOUTHEASTERN SPECIES OF BAETISCA (EPHEMEROPTERA: BAETISCIDAE)¹

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The last complete summary of the mayfly genus *Baetisca* was given by Needham, Traver, and Hsu in 1935. These authors re-described the five species known at that time and mentioned the description of *B. bajkovi* by Neave (1934), published after their manuscript had gone to press. The discovery of two new species, *B. thomsenae* Traver (1937) and *B. rogersi* Berner (1940), brought the total of recognized forms to eight. In this paper, I am presenting the description of two additional new species which have been collected in the southeast within the past few years.

The species of *Baetisca* are widely distributed over eastern North America, occurring from Lake Winnipeg southward to north-central Florida. A single species, *Baetisca obesa*, was reported by Eaton (1883-1887) from California; no other representative of the genus has since been reported in the literature from the western part of the continent. The presently recorded distribution of the North American species is as follows:

Baetisca callosa Traver—West Virginia, New York, Quebec

Baetisca carolina Traver—North Carolina, West Virginia, Tennessee, Quebec

Baetisca bajkovi Neave—Manitoba, Illinois, Indiana, Minnesota

Baetisca lacustris McDunnough—Manitoba, Ontario, Ohio

Baetisca laurentina McDunnough—Ontario, Quebec, New Brunswick, Illinois, Michigan

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Baetisca obesa (Say)—Indiana, Illinois, Michigan, New York, New Hampshire, California, Georgia, Florida

Baetisca rogersi Berner—Florida, Alabama

Baetisca rubescens (Provancher)—Quebec

Until the discovery of the two species herein described, there were only two representatives of the genus reported from the Coastal Plain. If I am correct in my assumptions, *B. rogersi*, *B. escambiensis*, and *B. gibbera* are Coastal Plain species, while *B. obesa* is widespread, occupying much of North America. I believe, however, that it is primarily an inhabitant of lowland streams. *Baetisca carolina* and *B. thomsenae*, synonymized below, appear to be inhabitants only of the Appalachian Mountains and the Piedmont.

Although the pattern of light and dark areas of the wings of *Baetisca* subimagos seems to be variable, I am presenting illustrations of the forewings of three species (Figs. 6, 8, 9). In these, the patterns are definitely unlike, pointing up the desirability of further investigation of this characteristic which may serve to separate the subimagos of this genus.

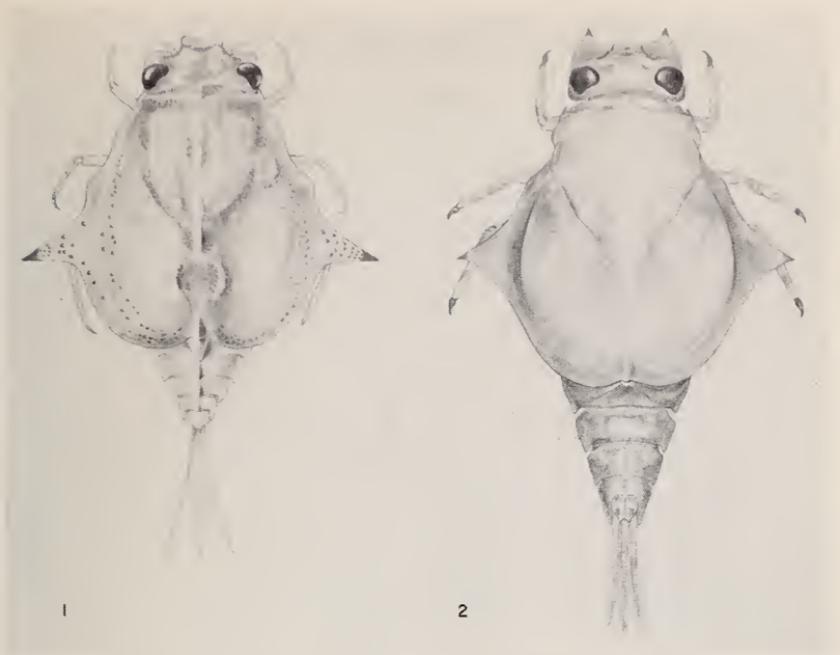
BAETISCA ESCAMBIENSIS n. sp.

(Figs. 5, 7, 8, 10, 15, 20)

Baetisca escambiensis is entirely distinct from any of the other species of this genus. It differs in the adult stage in having the wings flushed throughout with ruby color; in shape of the penes; and it is the only species in which the eyes are known to be banded with vertical stripes. In the nymphal stage, it is completely different by reason of the unusually long genal and the very long, thin, mesonotal spines, and the lack of frontal projections on the head.

MALE HOLOTYPE: Body length 10.9 mm.; mesothoracic wings 11.3 mm.; caudal filaments 8.4 mm.

Head: Eyes large, almost contiguous. A whitish area extends anteriorly over the vertex and is divided by a heavy, brown, median line. Ocelli large, deep brown at the base; color extends inward as a V-shaped mark toward the median, brown line; median ocellus lies between the arms of the V, and it, too, is extensively brown; area within the arms of the V is mottled brown. Red-brown markings present below the eyes and extending ventrally. Median carina and area below the antennae deep brown. Basal segment of antennae purplish brown; second segment and flagellum brown. Eyes with only a faint indication of a division, the lower portion slightly paler than the upper. Eyes distinctive because of the vertical banding of light and dark areas across their entire surface. The bands begin at the ventral edge of the eye and extend



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2



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Fig. 1. Nymph of *Baetisca rogersi*
Fig. 2. Nymph of *B. carolina*
Fig. 3. Nymph of *B. gibbera*

dorsally becoming more distinct in the upper part; they converge toward the ventral part.

Thorax: Pronotum almost completely concealed by the enormously developed eyes; brownish in color; median, brown line present extending the length of the segment. Intersegmental membranes purplish and the membranes between the sclerites also purplish. Mesonotum brown, mottled with lighter color; deepest brown in the central area. At the base of the scutellum there are two large, submedian, oblong, brown marks; remainder pale with margins outlined in dark brown. Metanotum dark brown. Prosternal process deep brown; intersegmental membranes purplish; mesosternum shiny brown; metasternum paler brown. Legs: Forelegs brown, not darker at the articulations; slightly darker at the distal end of the femur and tibia. Coloration of middle and hind legs similar to that of foreleg. Wings: Entire forewing (Fig. 7) and hindwing flushed with ruby; along the costal border the coloration is considerably more intense and extends its full length. Crossveins throughout the costal border are margined with a paler coloration producing a striated appearance; this deeper color extends to the area between R_1 and R_2 . The remainder of the membrane has a delicate flush of ruby. Very close to the base of the wing, and hardly extending beyond the bases of the main veins, there is a brownish tinge. Base of hind wing also colored with reddish-brown which extends up into the costal angle. In the hind wing, the flush of ruby extends throughout the membrane; near the leading edge of the wing and as far as the middle field, the crossveins are margined with paler areas so that there appears to be blocks of deeper ruby color between the crossveins. Longitudinal veins of fore and hindwing are dark with a reddish-brown tinge.

Abdomen: Tergites dark brown; intersegmental membranes give a purplish cast to the posterior border of each of the tergites. The points of former attachment of the gills in the nymphal stage are also outlined with this purplish coloration. On tergites 2-5, there is a very faint, submedian, pale line. Tergites 6-10 with a median, deep-brown line. Adjacent to the median line of tergite 6 and in its anterior half, there are submedian, triangular, pale areas followed by a large, butterfly-shaped, brown area; in the posterior half of the tergite, there is a large, triangular area, which has its apex at the mid-point of the tergite and extends posteriorly with its base on the posterior border of the segment; it is mottled brown, being deep brown toward the middle of the segment. There are large pale blotches in the outer portions of the butterfly-shaped area. The anterolateral portion of tergite 6 is occupied by a large purplish-brown triangular area. Adjacent to the median line of tergites 7-10 there is a lighter brown area, and laterally the tergites are colored with mottled brown that extends to the margins of the segments. Sternites brownish with a purplish tinge, more heavily colored on the lateral margins; middle portions shaded with purplish red which become more intense laterally. Intersegmental membranes purplish. On sternites 7 and 8 there is a large, pale, median, triangular area which is based on the posterior margin of the sternites and extends to about the middle of the segment. Genitalia distinctive (Fig. 20); forceps brown along their outer margins, inner margins pale; penes brown. Caudal filaments brown.

NYMPH: Body length of male nymphs averages 10.6 mm., of females 13 mm.

Head: Genae produced into very long, flat, sharp spines; tipped with deep brown; not upturned at tip. Head mottled with brown. No frontal projections. Antennae pale except at the very tip where they become dusky. Eyes of all nymphs examined are banded vertically as shown in Figure 5. Surface of head tuberculate; however, tubercles are only conspicuous on the genal shelf. Entire margin of head bordered with long hairs.

Thorax: The slightly recurved mesonotal spines, which are sharp and dark tipped, are the most prominent feature of the thorax. Thorax compressed dorsoventrally as compared with other species of *Baetisca* (Fig. 10). Conspicuous, deep-brown marks present as shown in Figure 5; two lateral marks present, one close to the anterolateral corner of the mesonotum, the other somewhat posterior to the first. A third pair of dark brown marks is adjacent to the median line and forms a V-shaped marking about the middle of the mesonotum. Dorsum of mesonotum mottled. Sternum pale except in the median part where there is a brownish area on the mesosternum and in the anterior portion of the metasternum. Entire lateral border of thorax margined with long hairs. Legs: Hairy; clusters of hairs at base of each leg; especially numerous on the femora; no hairs on tibiae and tarsi. Legs pale, unbanded. Claws extremely long and thin (Fig. 15); sharp tipped and golden brown distally.

Abdomen: Lateral margins of segments 6-8 expanded and flared outwards as shown in Figure 5; these segments bordered with long hairs; posterolateral angles terminate in sharp points. Lateral margins of 9 and 10 with only very short hairs; segment 9 also has short, serrate spines on margins. These serrate spines also present on other segments but are partially concealed by the long marginal hairs; serrations begin just before the mesonotal spine and continue posteriorly, becoming more prominent posterior to the spine. Abdominal segment 6 brown on anterior half, posterolateral portions pale; median triangular section posterior to the hump is mottled brown. Tergites 7-10 have a median brown line extending the length of the segment; lateral to the median line on 7 and 8, there is a pale rectangular area; lateral to this and extending almost to the border, the segment is mottled brown; flange translucent. Posterior median portion of tergites 7-9 upturned, although not forming a distinct, posteriorly directed spine (Fig. 10). Ventrally pale; light brown mottling in the anterolateral portions of sternites 3-6. Caudal filaments light brown.

Examination of half-grown nymphs shows that they are very much the same structurally as mature specimens and have similar markings. However, the genal and mesonotal spines are more accentuated, as are the posterolateral spines of the abdominal segments. The upturned posterior edges of segments 7-9 are also more exaggerated. On some young nymphs, the lateral mesonotal spine may be long and thin and half as long as the entire mesonotum; the genal spines are as long as the head. The general spinose appearance of young nymphs rivals that of some of the more bizarre species of membracids.

HOLOTYPE: Male imago (reared) preserved in alcohol. Florida, Escambia County, Escambia River. October 23, 1954. Collected by C. D. Hynes and

L. Berner. Emerged in laboratory on November 6. In the University of Florida Collections.

PARATYPES: 6 males (reared), 5 preserved in alcohol, 1 pinned. Same data as holotype. Emerged in laboratory between November 5 and 14. In the University of Florida Collections.

VARIATIONS: The paratypes are remarkably constant and fit the description of the holotype. They vary only in the slight tendency toward formation of annulations on the tarsal segments of the middle and hind legs.

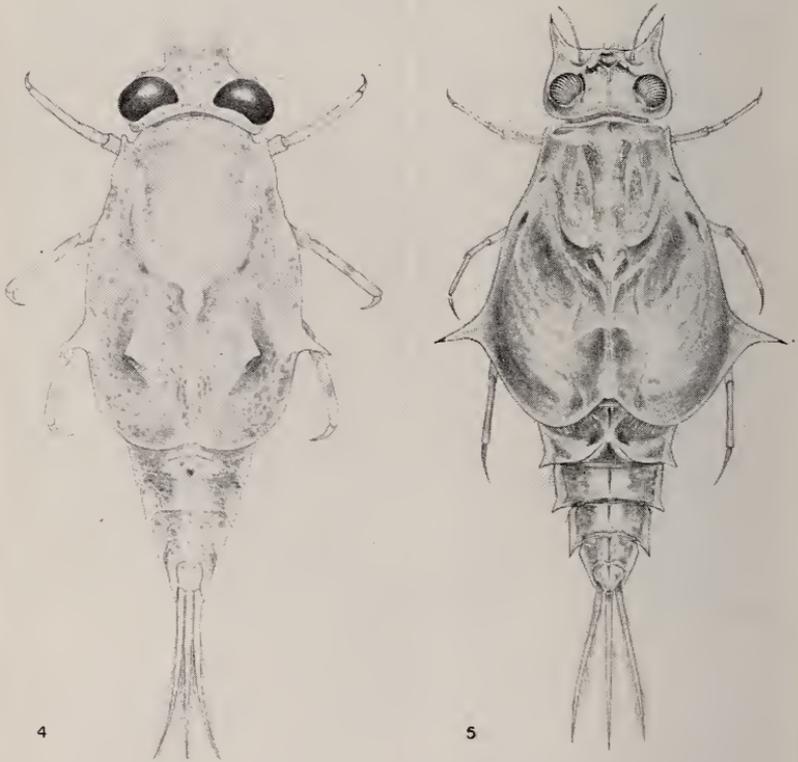


Fig. 4. Nymph of *B. obesa*

Fig. 5. Nymph of *B. escambiensis*

No females were reared to the adult stage although a number of subimagos were obtained. An examination of these immatures indicates that the color pattern of the head, thorax, and abdomen is very much the same as that of the male holotype with only minor differences. The basal segments and the flagellum of the antennae are deep brown in some specimens and in others has the same coloration as that of the male; the face is mostly deep brown. The coxae on the outer sides are colored with deep brown, and the tibiae, in their outer part, and the distal segments of the tarsi of all legs are dark brown. Whether this deeper coloration of the tarsi carries over into the adult stage remains to be determined. The banding of the eyes as seen in the male adults is also present in the female subimagoes.

B. escambiensis nymphs were found on a sandbar in the Escambia River in shallow water from four to five inches up to about one foot in depth, where they lay partially buried in the stream bed. In the area from which the nymphs were taken there was a fine layer of silty mud overlaying the sandy bottom. Where they were most abundant, there was also an admixture of clay in the sand. The current was relatively slow, and in some places there was a growth of algae over the bottom. In almost every place that the *Baetisca* nymphs were found, young *Hexagenia* were also taken. The specimens were collected by the use of a screen held by one person downstream while another kicked up the mud and sand. There was relatively little gravel in the places that the nymphs were found to be most abundant.

Examination of another sandbar, where there was a slight amount of gravel mixed with sand and mud, revealed a few nymphs, but they were not as common as in the first habitat. No more than four nymphs were taken at any one time during the period of collecting on October 23; however, on August 24 they were far more abundant and many nymphs were caught with each disturbance of the sand.

The sandbar which was the most prolific producer of the nymphs was about fifteen feet long and five feet wide (Fig. 23). In August about 50 or 60 nymphs were taken from this bar. During the morning of October 23, in a period of about three hours of hard work, we were able to collect another fifteen mature specimens from the same sandbar. Again in the afternoon we worked an-

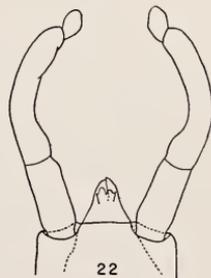
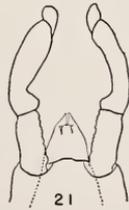
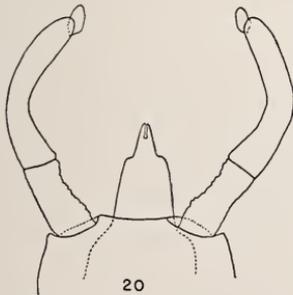
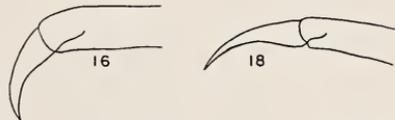
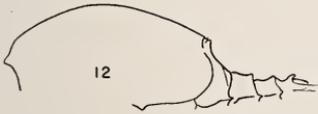
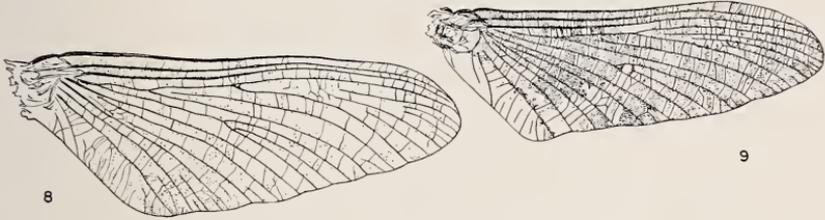
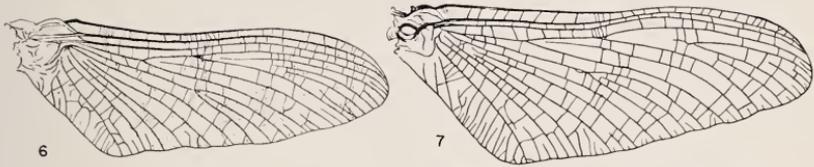
other two hours at the same place and found an additional fifteen mature nymphs.

The *Baetisca* nymphs were found on the sloping sides of the sandbar where the shelving was rather steep, the grade being estimated to be roughly about 20 percent. The relatively slow current was deflected laterally across this shallow zone. Where the algae were dense, no *Baetisca* nymphs were found, but where it was sparse and the layer of silty mud overlaying the sand thin, the nymphs appeared to be common.

The Escambia River was clear and colorless at the time of the October collections; the water temperature was 65° F., and was alkaline, as evidenced by the presence of large numbers of snails. The River has a very clean, white, sand bottom with a swift flow in midstream. It is a large river, being about 300 feet across and, at the time we studied it in October, its deepest point was probably not more than about five feet. However, the normal water level of the stream would probably have been around ten to fifteen feet in the deeper regions. This low water level was a reflection of the extremely dry summer that northwestern Florida and southeastern Alabama had suffered in 1954.

The first collection of nymphs was made in August by my assistant, Mr. C. D. Hynes, who discovered them through the painful process of having the spiny insects stick to his arms as he examined material on a collecting screen. As soon as he recognized the nymphs as being those of *Baetisca*, he began collecting a series and was successful in taking a large number. Although we examined the stream in many places in October, we were not often

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- Fig. 6. Forewing of *B. rogersi*, male subimago
Fig. 7. Forewing of *B. escambiensis*, male adult
Fig. 8. Forewing of *B. escambiensis*, male subimago
Fig. 9. Forewing of *B. obesa*, male subimago
Fig. 10. Profile of thorax and abdomen of *B. escambiensis*, nymph
Fig. 11. Profile of thorax and abdomen of *B. rogersi*, nymph
Fig. 12. Profile of thorax and abdomen of *B. carolina*, nymph
Fig. 13. Profile of thorax and abdomen of *B. gibbera*, nymph
Fig. 14. Profile of thorax and abdomen of *B. obesa*, nymph
Fig. 15. Tarsal claw, right hind leg of nymph, *B. escambiensis*
Fig. 16. Tarsal claw, right hind leg of nymph, *B. gibbera*
Fig. 17. Tarsal claw, right hind leg of nymph, *B. carolina*
Fig. 18. Tarsal claw, right hind leg of nymph, *B. rogersi*
Fig. 19. Tarsal claw, right hind leg of nymph, *B. obesa*
Fig. 20. Male genitalia, *B. escambiensis*
Fig. 21. Male genitalia, *B. obesa*
Fig. 22. Male genitalia, *B. rogersi*



successful in finding the nymphs in other habitats, in spite of the fact that we looked in numerous other shallow, sandy areas that resembled the sandbar from which we collected most of the nymphs.

In the October collections, about 45 nymphs were taken and kept alive. These were brought back to the laboratory for rearing. Despite the long trip to Gainesville and the confinement of the nymphs in gallon plastic containers for nearly 24 hours before being placed in aerated rearing pans, none died.

Observation of the nymphs in the laboratory showed that they lie partially covered in the soft, silty sand with only a small part of the mesonotum and a little of the abdomen protruding above the level of the sand. Most of them were so well concealed that they were not detectable until the sand was disturbed. Their coloration makes it possible for them to blend perfectly with their background.

Even though flowing water was not used in the laboratory for rearing, the insects were kept alive in aerated water in rearing pans as late as November 20. By this date those that had not already emerged finally died. Those that died did so not because of lack of food or air, but simply because they were unable to emerge. Of the 45 nymphs which were kept for rearing, 25 emerged successfully and of these seven male subimagoes molted to the adult stage.

When ready to emerge, the nymphs crawled out of the water onto the air hose or a stick which was kept in the pan. In emerging, they crawled to a distance about one inch above the water level, where they clamped their claws firmly into the support. After several minutes to as much as an hour, the subimago appeared. Earliest observed emergence began at 9:30 a.m. and the latest occurred about 1:30 p.m. Whether this is the time of day the species emerges under natural conditions is still unknown. The average time for the subimagal stage in the laboratory, where the temperature ranged from a low of about 60° F. at night to a high of 75° F. in the daytime, was approximately 40 to 44 hours. Although a number of females emerged, not one was able to undergo the subimagal molt. Because I felt that low humidity might be responsible for the fact that the specimens were unable to undergo their molt, I put them in a chamber in which the moisture was high. Even so, the females were still unable to molt, although they remained alive for as long as four days after emerging.

The nymphs collected in August were half grown. Suspecting that this was probably a late-emerging species, my assistant and I traveled to the Escambia River on October 23 and were fortunate in finding the mature nymphs. These, when brought back to the laboratory, proved that I was correct in my assumptions. November is an unusually late month for emergence of a species of *Baetisca*, especially from the northwestern part of Florida. Other species of *Baetisca* emerge much earlier in the year, usually from February through June. Nymphs of *B. escambiensis* that were taken in August were approximately of the same size; the October specimens were probably from the same brood.

In addition to very young *Hexagenia* sp. nymphs that were taken along with the nymphs of *Baetisca*, nymphs of *Brachycercus* sp. were also collected from the mud in approximately the same place that the *Baetisca* nymphs were found. The *Brachycercus* specimens were also mature and ready to emerge; however, I was unsuccessful in my attempts to rear this species in the laboratory.

BAETISCA GIBBERA n. sp.

(Figs. 3, 13, 16)

A study of available specimens of the various species of *Baetisca* has convinced me that I have a new species of this genus represented only by the nymphal stage. A comparison of my specimens with nymphs of *Baetisca lacustris* from Michigan, as well as with the illustrations of the nymph by McDunnough (1932), reinforces this conviction. The affinities of *B. gibbera* seem to lie with *lacustris* insofar as the structure of the nymph is concerned. The adult is still unknown although nymphs were brought back to the laboratory and kept alive for a period of two weeks in an attempt to rear the species.

Baetisca gibbera differs from all of the known species of *Baetisca* in the shape of the mesonotal spines and the lack of strongly produced frontal and genal processes. The mesonotum is enormously humped; much more so than in most other species. The mesonotal spines are short and blunt, rather than being pointed as in most of the other species.

Because of its distinctive body shape, I am describing this nymph as a new species. It is my opinion that a species is best described

from the form which is most readily differentiated. In the genus *Baetisca*, the nymphal stage is the most useful for this purpose.

HOLOTYPE NYMPH: Body length 7.5 mm.; caudal filaments 2.2 mm.

Head: Genal projections extend only slightly forward in front of the head; broadly rounded at anterolateral corners; projections brown medially and outlined with a clear area of chitin. Frontal projections small, rounded; very slightly elongated at the anterolateral corners (Fig. 3). Remainder of head mostly brownish but deep brown anterior to the eyes. Dark area lateral to antennal base and anterior to compound eye extends out onto the genal shelf. Eyes black. Lateral ocelli just posterior to the antennal bases appear as clear, white spots on the top of the head. Antennae pale; faintly washed with brown. Entire upper surface of head covered with small tubercles. Ventral aspect of genal shelf covered with small tubercles as well as outer parts of mandibles and labrum. Mouthparts like those of other species of the genus.

Thorax: Pronotum covered with the same types of tubercles as those on the head, except that they are somewhat smaller. Mesonotum conspicuously large, being very wide and much humped (Figs. 3, 13). Entire surface tuberculate, but not as distinctly so as the pronotum. Lateral spines short and blunt. Anterior to the lateral mesonotal spines there are sinuous curves as shown in Figure 3. Anterolateral angles of mesonotum extend forward to form a cup into which the head fits and completely enclose the pronotum. No dorsal spines present on mesonotum. On a direct line with lateral spines, there are two large, submedian, white spots and lateral to these there are two additional white spots; an irregular pattern of brownish areas over the whole mesonotum. Metanotum concealed. Ventrally the thorax is also tuberculate. Legs: Femora of all legs tuberculate. Fore femur dark in outer, basal portion; tibia dark on outer side; tarsus banded with brown in medial portion. Mid and hindleg with the coxae dark on outer side; femora dark basally becoming lighter distally; tibiae almost completely covered with brownish shading; tarsi banded medially with brown. Claws of all legs fairly long, tipped with deep amber (Fig. 16). At upper edge, each femur margined with long hairs.

Abdomen: Dorsally all tergites covered with same small tubercles seen on other parts of body; these are much more prominent on posterior margin of tergite 6 than on other tergites; however, they show up well on the lateral margins of the others. No median posterior spines on tergites 7 and 8 but 9 has a short one as illustrated in Figure 13. Tergite 10 with a U-shaped excavation such as found in all other species of this genus; tips of excavation outlined in white. Median line of tergites 7-9 deep brown in anterior half, remainder a fine, white line. Anterior and lateral portions of tergites 7 and 8 shaded with deep brown, median portion lighter; tergite 9 with definite light areas and yellowish blotches. Tergite 10 stippled with brownish blotches. Sternites tuberculate; no distinctive markings. Caudal filaments light brown; median filament slightly darker than the laterals.

HOLOTYPE: Nymph preserved in alcohol. Florida, Escambia County, Escambia River, October 23, 1954. Collected by C. D. Hynes and L. Berner. In the University of Florida Collections.

PARATYPE: 7 nymphs. All specimens in the University of Florida Collections. Florida: Clay County, Black Creek, November 26, 1951, one nymph collected by W. M. Beck; January 25, 1954, one nymph collected by L. Berner; Escambia County, Escambia River, October 23, 1954, one nymph collected by C. D. Hynes and L. Berner. Georgia: Baker County, Ichawaynochaway Creek, November 27, 1953, three nymphs collected by L. Berner; Echols County, Alapaha River, February 2, 1954, one nymph collected by L. Berner.

VARIATIONS: Lateral spines of mesonotum very short and very blunt in one specimen; however, they do form distinct lateral mesothoracic spines. One nymph about a third grown has very long spines which are twice as long in proportion to the width as those of specimens bearing the very shortest spines. The tips of the spines on this long-spined form approach being sharp pointed. Some specimens are intensely blotched with brown on mesonotum and abdomen, and the median line of the abdominal tergites is entirely deep brown. Dark shading on the tibiae is restricted on some specimens to the base just beyond the knee on the outer side.

Baetisca gibbera was first taken in 1951 and reported as *Baetisca* sp. (Berner, 1953). This nymph was collected from Black Creek,



Fig. 23. The Escambia River showing in the foreground the sandbar from which most of the nymphs of *B. escambiensis* were taken. Mr. C. D. Hynes is handling the screen with which the specimens were captured.

a rather swift-flowing, deep, acid stream, where it was found attached to a log. I have revisited the stream and, after a considerable amount of work, took another nymph from a pebbly riffle about 12 inches in depth. Another specimen was taken at the Alapaha River and this nymph, too, was found clinging to the underside of a log that was anchored at the bank of the stream. The Alapaha is a deep, dark-colored stream draining the Okefenokee Swamp. It has a sand bottom and is approximately 100 feet in width. *Baetisca obesa* nymphs were found near the place where the single *B. gibbera* was located.

Three nymphs of *B. gibbera* were collected at the Ichawaynochaway Creek from a pebbly riffle near the shore where the flow was swift. The water was three to five inches deep and the pebbles were rather coarse in size. The nymphs were taken by stirring up the pebbly bottom and catching the material that was loosened as it was carried downstream. Although a careful search of the creek was made, no other nymphs were found. A second examination of this same stream in May, 1954, did not produce any of these nymphs. The Ichawaynochaway is also a fairly large, deep stream in which the water is strongly tinted. The water was alkaline and snails were abundant. The last collection of *B. gibbera* was made in the Escambia River in October, 1954, along with *B. escambiensis*. The nymphs were found on the sloping bank in about three to twelve inches of water where there was a thin overlaying layer of small pebbles. By kicking up the bottom several nymphs of *B. escambiensis* and four of *B. gibbera* were collected on a screen held downstream. Only one of the latter was carried back alive to the laboratory where it lived for about a week without emerging.

BAETISCA OBESA (Say)

(Figs. 4, 9, 14, 19, 21)

The specimens that I am calling *B. obesa* resemble the forms described by Say (1839), Walsh (1863), Traver (1935), and Burks (1953) but differ in certain minor respects. Rather than again re-describe the species, I am simply mentioning the characteristics which deviate from those of the northern form. These differences, which I do not believe to be specific, appear to be confined to the adults; I can find no significant departures in the immature stage.

Male: The forelegs of the southern specimens are washed with a dusky coloration which is distinctly heavier at the femorotibial joint, and each tarsal joint is slightly shaded; the claws are brown. In the hindlegs, the femora, on the outer surface, have a faint, brownish band in the distal portion; the banding of the tarsal segments is quite distinct at the articulations and the claws are deep brown. The abdominal tergites are purplish brown with some variably-shaped, white blotches. Ventrally, the abdominal sternites are purplish brown laterally but very pale medially. There is an obsolescent pair of submedian brown spots on each of sternites 2-5; these are most distinct on sternites 2-4. Genitalia are very similar to those illustrated by Traver (Needham, Traver, Hsu, 1935, Fig. 148). Caudal filaments have the basal three segments distinctly annulate at the joints; distally the annulations become very faint and in the outer $\frac{4}{5}$ ths of the tails there is no banding. Wing length shorter than previously reported for this species, ranging from $7\frac{1}{2}$ to 8 mm.

Female: Legs of the female are rather heavily shaded with brown; tarsal annulations very distinct on all legs; the claws are dark. The first three segments of the caudal filaments are heavily ringed with brown; posteriorly the annulations become less prominent and finally disappear in the distal half. Wing length ranging from $7\frac{1}{2}$ to 9.3 mm.

Although *Baetisca obesa* has been known since the early part of the last century, almost nothing has been written of the ecology and habits of the nymphs. One of the few references is that of Walsh (1864) in which he says "The habits of this species are to frequent rapidly-running rivers, and to attach themselves in repose to the undersurfaces of submerged stones." This is a totally different sort of habitat from that in which my assistant and I have been able to collect the large number of nymphs we have taken. Previously nymphs have been scarce in collections. Whenever I have collected in moss attached to submerged tree trunks at stream banks, I have found the species to be common.

B. obesa has previously been reported from Georgia (Needham, Traver, Hsu, 1935) and from Florida (Berner, 1953). The nymphs almost invariably occur in very slow to almost stagnant water where they may be very common in moss or other vegetation. They have been found in some numbers in moss which is attached to the submerged trunks of cypress, willow and ash. In all of the streams from which these nymphs have been taken, the water has

been strongly colored and deep. The Withlacoochee River, which flows from southern Georgia into northern Florida and empties into the Suwannee River, has been the most prolific producer of this particular species; however, nymphs have been collected from other streams as well. The nymphs are usually found when moss is shaken vigorously into a strainer or taken out of the stream and put into a pan of water and shaken. The nymphs loosen their hold and swim about making it possible to collect them easily.

Nymphs were brought into the laboratory alive on January 28. From these a number of subimagoes emerged from early March to early April. Nymphs collected from the Withlachochee River, four miles west of Valdosta, Georgia, produced subimagoes until the end of March, when emergence ceased and the remainder of the nymphs died attempting to emerge. Emergence differs from that of other species in that the immatures do not necessarily climb out of the water. That nymphs also to climb out of the water to emerge is evidenced by the fact that on April 13 at the Strong River, Rankin County, Mississippi, a single *B. obesa* skin was found on a bridge piling about ten inches above the water line.

The habits of this species differ entirely from those of any other species of *Baetisca* presently known in that they are not dwellers on the stream bottom and do not live on sand but cling to, and live deep within, vegetation masses. Other species occur where water flows swiftly; *B. obesa* lives in the quieter parts of the stream. This is indeed a departure from the previously described habits for this particular species, or any species in the genus *Baetisca*.

Locality Records: Florida: Hamilton County, Withlacoochee River, February 2, 1954; March 14, 1954; Madison County, Withlacoochee River, January 28, 1954. Georgia: Echols County, Alphaha River, February 2, 1954; Lowndes County, Withlacoochee River, March 13, 1954. Mississippi: Rankin County, Strong River, April 13, 1954.

BAETISCA ROGERSI Berner

(Figs. 1, 6, 11, 18, 22)

Since *B. rogersi* was described in 1940, it has been recorded on several other occasions, but it is still relatively rare in collections. The species is now known from northwest Florida, southeastern Alabama, and from Georgia, south of the Fall Line. The habits and ecology of *B. rogersi* were described earlier (Berner, 1950)

and will not be redetailed here. Locality records include only those previously unpublished.

Locality records: Florida: Liberty County, Sweetwater Creek, April 14, 1951 (adults reared on April 26, 30, and May 5); Gadsden County, Flat Creek, April 4, 1953, nymphs; Crooked Creek, March 20, 1954, nymphs. Georgia: Decatur County, Mosquito Creek at Bainbridge Road, March 28, 1954, nymphs; Peach County, Mossy Creek, April 10, 1954, nymphs.

BAETISCA CAROLINA Traver

(Figs. 2, 12, 17)

I have carefully examined the type specimens of *B. carolina* and paratypes of *B. thomsenae* Traver.³ These two species were differentiated by Traver (1937) solely on relative differences. I am unable to concur in her opinion that these are distinct species and am, therefore, considering *thomsenae* to be a synonym of *carolina*. It is my belief that the deviations in the characteristics used to distinguish these species are due only to local variations. All other species of *Baetisca* are clearly distinct morphologically in the nymphal stage, yet there are no such distinctions here. The degree of intensity of the coloration of the wings is well known to be a variable character in other species. Because the coloration has totally disappeared from the wings of the long-preserved specimens of both species, I was unable to utilize it in my study of these two; in spite of that, I do not feel that it is a valid characteristic for erecting a separate species for the Valle Crucis specimens. The other adult characters used by Traver, in my opinion, are not significant.

In addition to Traver's records of *B. carolina* from North Carolina, the species has been reported from Tennessee (as *B. thomsenae*, Wright and Berner, 1949). I have a single additional specimen also collected in North Carolina from Little River, Transylvania County, June 12, 1953, by M. J. Westfall.

KEY TO NYMPHS

- 1 Both dorsal and lateral spines present on mesonotum.
Frontal projection strongly developed (Fig. 4) *obesa*

³ I am indebted to Dr. Henry Dietrich, Cornell University, for the privilege of studying types and paratypes of *Baetisca carolina* and paratypes of *B. thomsenae*.

- 1' Lateral spines only on mesonotum. Frontal projection less well developed or absent (Fig. 2) 2
- 2 Genal spines present (Fig. 5) 3
- 2' Genal spines absent (Fig. 3) 4
- 3 Genal spines much shorter than head; upturned at tip. Lateral mesonotal spines moderately developed. Posterolateral abdominal spines incurved (Fig. 2) *carolina*
- 3' Genal spines as long as head; not upturned. Lateral mesonotal spines strongly developed. Posterolateral abdominal spines curve outwards (Fig. 5) *escambiensis*
- 4 Lateral mesonotal spines strongly developed, acuminate; anterior to these spines another lateral projection is present at margin of mesonotum; large spine-like tubercles on dorsal surface of mesonotal spines. Posterolateral angles of abdominal segments not incurved (Fig. 1) *rogersi*
- 4' Lateral mesonotal spines poorly developed; tips blunt; no lateral projection anterior to mesonotal spines. Posterolateral angles of abdominal segments incurved (Fig. 3).....*gibbera*

KEY TO ADULTS

- 1 Wings flushed with ruby. Penes with a lateral angulation near tip (Fig. 20) *escambiensis*
- 1' Wings colored only at base, or without color; penes without strong lateral angulation near tip (Figs. 21, 22) 2
- 2 Wings hyaline *obesa*
- 2' Wings colored basally 3
- 3 Basal third of forewing and basal three-fourths of hindwing reddish-brown; longitudinal veins amber. Abdominal tergites light reddish brown; sternites yellowish white. Coastal Plain species *rogersi*
- 3' Basal portion of wings orange brown; hindwing tinted throughout or only for half its width; longitudinal veins brown. Sternites light tan. Appalachian and Piedmont species *carolina*

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